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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,154	12/16/2005	Jozef Peter Paul Huijsmans	TS1268 US	2824

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EXAMINER	
MOHADDES, LADAN	
ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,154	HUIJSMANS ET AL.	
	Examiner	Art Unit	
	LADAN MOHADDES	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 July 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *8 and 9* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 10-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-7 and 10-16 rejected under 35 U.S.C. 103(a) as being unpatentable over Farooque (US Patent 4,917,971, already of record) in view of Hildebrandt et al. (US Patent 5,175,061, hereafter referred to as Hildebrandt, already of record) in further view of Nakazawa (US Patent 5,134,043).

Regarding claims 1, 4, 7, 12-16, Farooque discloses a process for the generation of electricity (Fig. 2) and the production of concentrated carbon dioxide (col 4, ln 17-26, and ln 62-65) by using a molten carbonate fuel cell (col 2, ln 64-65), the fuel cell comprising an electrolyte, an anode and a cathode, an anode chamber and a cathode chamber (col 2, ln 6 to col 3, ln 11), wherein the process comprises: feeding a fuel gas to the anode chamber (col 3, ln 12-13) and a cathode inlet gas comprising carbon dioxide and molecular oxygen to the cathode chamber (col 4, ln 22-26); producing electricity (Fig. 2), an anode off-gas (Fig. 5, **56**) and a cathode off-gas (Fig. 5, **61**) via anode and cathode reactions (col 3, ln 12-18); wherein part of the anode off-gas is fed to a catalytic afterburner (Fig. 5, **67**) wherein it is oxidized with an oxidant (Fig. 5, **68**); and the remainder of the anode off-gas is recycled to the anode chamber (as applied to claims 1 and 4) (Fig. 5, **65** and **51a**); wherein the cathode off-gas goes through a heat exchanger (Fig. 5, **59**) and is mixed with external oxidant (Fig. 5, **62**) and the mixture and anode off-gas (Fig. 5, **63** and **69**) are fed to cathode through a cooling (heat exchange) assembly (col 5, ln 68 to col 6, ln 1).

Farooque does not expressly disclose that the oxidant stream comprises at most 20% (v/v) nitrogen. In the same field of endeavor, Hildebrandt teaches a high temperature fuel cell for production of electricity and CO_2 wherein the oxidant comprises

99.5% oxygen and only 0.1% nitrogen (as applied to claims 1, 7, 12-14 and 16), for the benefit of a) avoiding cathode cover up by nitrogen which decreases CO_2 conversion and reduces the efficiency of the fuel cell; b) preventing dilution of CO_2 and oxygen mixture by nitrogen; and c) eliminating the need for nitrogen removal and hence large waste gas stream (col 1, ln 35-52). Therefore, it would have been obvious for the person of ordinary skills in the art at the time the invention was made to use oxygen enriched gas with low amount of nitrogen as oxidant.

In addition, Farooque does not expressly disclose a set point for CO_2 concentration in the range of 5-40% (or 10 -30% as in claim 15) in the cathode chamber outlet. Nakazawa teaches recycling CO_2 with anode off-gas to the cathode chamber in a molten fuel carbonate fuel (col 2, ln 59-69). Wherein the concentration of CO_2 in the cathode inlet is high (col 2, ln 41, 30%) and the utilization factor is low (col 7, ln 52, 54.5%), rendering the concentration of the CO_2 in the cathode outlet within the range disclosed by applicant, for the benefit of improving power generation efficiency in the fuel cell (col 2, ln 47-49). Therefore, it would have been obvious for the person of ordinary skills in the art at the time the invention was made to increase the CO_2 concentration in the cathode.

Regarding claim 2, Farooque discloses that anode off-gas further passes through a heat exchanger (Fig. 5, **52**) to separate water from carbon dioxide stream (col 5, ln 35-36).

Regarding claims 3 and 5, Farooque discloses that the fuel gas is hydrocarbon gas such as methane (col 3, ln 6) and is converted to hydrogen and carbon monoxide in anode chamber (Fig. 1, 2, col 3, ln 14 and col 5, ln 12).

Regarding claim 6, Farooque discloses that the fuel gas is a reformer effluent comprising hydrogen and carbon monoxide (col 5, ln 21-23).

Regarding claims 10-11, Farooque in view of Hildebrandt and in further view of Nakazawa does not expressly disclose the amount of the off-gas recycled to the anode chamber. However Hildebrandt gives an example of amount gas recycled back to anode and CO_2 amount fed back to cathode after water separation (col 3, Table 2). Therefore, it would have been within the skill of the ordinary artisan to adjust the amount of anode off-gas recycled to the anode chamber to be within the range so that optimum amount of H_2 and CO is provided to the anode. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

Response to Arguments

5. Applicant's arguments filed 07/19/2010 have been fully considered but they are not persuasive.

On page 4 of Remarks, the applicant has argued that it would have not been obvious to combine the teaching of prior art Farooque and Hildebrandt. The examiner respectfully disagrees and points out that the examiner has relied on Hildebrandt to only fill in where Farooque is silent about the amount of nitrogen in the oxidant stream.

Hildebrandt teaches oxidant stream with less than 20% volume nitrogen and provides motivation for choosing so as high amount of nitrogen reduces the efficiency of fuel cell. In addition, Hildebrandt teaches that if low amount of nitrogen is used the need for nitrogen removal is eliminates and a large amount of the gas stream is not wasted. Therefore, by knowing the benefits of using oxidant stream having low nitrogen percentage thought by Hildebrandt , it would have been obvious for a person of ordinary skills in the art to low nitrogen concentration in the oxidant stream of Farooque.

Furthermore, on page 4 of Remarks, the applicant has argued that Nakazawa prior art does not teach the concentration of the carbon dioxide in the cathode chamber outlet. The examiner respectfully disagrees and points out that Nakazawa teaches the concentration of CO2 in the cathode inlet is 30% (col 2, ln 41) with utilization factor of 54.5% (col 7, ln 52). This results in concentration of CO2 in the cathode outlet to be around 16.35% which is well within the range disclosed by the applicant (5-40% or 10-30% (as in claim 15)). Therefore, Nakazawa teaches the concentration of CO2 in the cathode outlet contrary to the applicant's assertion.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LADAN MOHADDES whose telephone number is (571)270-7742. The examiner can normally be reached on Monday to Thursday from 8:30 AM to 6:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LADAN MOHADDES/
Examiner, Art Unit 1795

/Patrick Joseph Ryan/
Supervisory Patent Examiner, Art Unit 1795